High Temperature Smart Structures for Engine Noise Reduction and Performance Enhancement, Phase II

Completed Technology Project (2005 - 2007)

Project Introduction

Noise mitigation for subsonic transports is a continuing high priority, and recent work has identified successful exhaust mixing enhancement devices (chevrons) that have demonstrated substantial capability for reducing aircraft engine noise in critical takeoff and landing conditions. Existing fixed-geometry chevrons, however, are inherently limited to optimal noise mitigation in a single operating condition and also can impose significant performance penalties in cruise flight. An adaptive geometry chevron using embedded smart structures technology offers the possibility of maximizing engine performance while retaining and possibly enhancing the favorable noise characteristics of current designs. Phase I identified a promising candidate for a variable geometry chevron using high force Shape Memory Alloy (SMA) actuators. Building on coupled CFD/finite element modeling predicting successful performance, subscale demonstration-level actuated chevrons were constructed that yielded the required deflections in both benchtop and low speed wind tunnel tests. Phase I also identified and tested new high temperature SMA (HTSMA) materials technology to enable the devices to operate in both low temperature (fan) and high temperature (core) exhaust flows. The proposed Phase II effort will continue development of this technology and demonstrate extension of this concept to operation at full-scale stiffness levels and at realistic dynamic pressure and temperature conditions.

Primary U.S. Work Locations and Key Partners

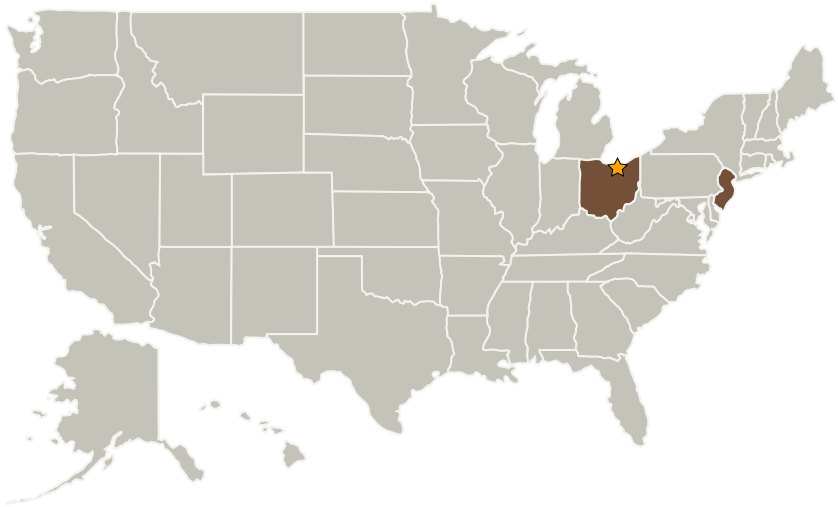

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Continuum Dynamics, Inc.	Supporting Organization	Industry	Ewing, New Jersey

Primary U.S. Work Locations	
New Jersey	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.4 Aeroacoustics